

**A Method of Making a Dual Performance  
Nonwoven and the Products Therefrom**

**Technical Field**

The present invention relates generally to a cleaning laminate, and specifically to a dual performance cleaning laminate comprising two functionally diverse surfaces, wherein said laminate has an abrasive side that facilitates the process of loosening particulates, such as dust and dirt, and an opposing soft, absorbent side, such material being imminently suitable for application in cleaning and cleansing applications.

**Brief Description of the Drawings**

FIGURE 1 is a diagrammatic view of a forming apparatus for forming a nonwoven cleaning laminate in accordance with the principles of the present invention;

FIGURE 2 is a photomicrograph of the abrasive side of the nonwoven cleaning laminate in practicing the present invention;

FIGURE 3 is a photomicrograph of the soft, absorbent side of the nonwoven cleaning laminate in practicing the present invention;

FIGURE 4 is a photomicrograph on a macroscopic scale of the abrasive side of the nonwoven cleaning laminate in practicing the present invention; and

FIGURE 5 is a photomicrograph on a macroscopic scale of the soft, absorbent side of the nonwoven cleaning laminate in practicing the present invention.

**Detailed Description**

While the present invention is susceptible of embodiment in various forms, there will hereinafter be described, presently preferred embodiments, with the understanding that the present disclosure is to be considered as an exemplification of the invention, and is not intended to limit the invention to the specific embodiments disclosed herein.

The nonwoven laminate of the present invention is comprised of coarse denier meltblown filaments, wherein a spunbond resin is utilized with a

conventional meltblown process so as to capture thicker filaments. In general, the meltblown process utilizes a molten polymer is extruded under pressure through orifices in a spinneret or die. Traditionally, high velocity air impinges upon and entrains the filaments as they exit the die. Usually the energy of this step is such that the formed filaments are greatly reduced in diameter and are fractured so that microfibers of finite length are produced. Utilizing a spunbond resin with a lower melt flow rate, as well as lowering the air pressure, however, allows the collected filaments to take on a thicker diameter, providing the overall collective web with a desirable coarse texture. The process to form either a single layer or a multiple-layer fabric is continuous, that is, the process steps are uninterrupted from extrusion of the filaments to form the first layer until the bonded web is wound into a roll. Methods for producing these types of fabrics are described in U.S. Patent No. 4,041,203, hereby incorporated by reference. The resultant filaments may be of various cross-sectional profiles, which are not considered a limitation to the practice of the present invention.

In a particular embodiment, a polypropylene spunbond resin, commercially known as PP3155 made available by Exxon Chemical Company was utilized. The aforementioned resin had a 35 MFR and was extruded at an average die temperature of 562° Fahrenheit with an approximate throughput of 7.1 grams/hole/min. Further, the distance between the meltblown die and the collective surface was around the order of 19 inches. The resultant meltblown filaments have a denier between that of 5 and 50 microns. Suitable polymers that may be used in the meltblowing process of the present invention include those selected from the group consisting of polyolefins, polyesters, polyetheresters, and polyamide.

Optionally, prior to extrusion, the single polymeric resin can be compounded with various melt-additives, so as to assist with the processing conditions, enhance the performance of the web, or enhance the appearance of

the web, such additives including, but not limited to thermal stabilizers, colorants, and aromatics.

The dual purpose cleaning wipe of the present invention also comprises a soft, absorbent layer capable of picking up liquids and particulates. A nonwoven of this nature may be a fibrous nonwoven layer or a continuous filament nonwoven layer. In general, continuous filament nonwoven fabric formation involves the practice of the spunbond process. A spunbond process involves supplying a molten polymer, which is then extruded under pressure through a large number of orifices in a plate known as a spinneret or die. The resulting continuous filaments are quenched and drawn by any of a number of methods, such as slot draw systems, attenuator guns, or Godet rolls. The continuous filaments are collected as a loose web upon a moving foraminous surface, such as a wire mesh conveyor belt. When more than one spinneret is used in line for the purpose of forming a multi-layered fabric, the subsequent webs are collected upon the uppermost surface of the previously formed web. The web is then at least temporarily consolidated, usually by means involving heat and pressure, such as by thermal point bonding. Using this means, the web or layers of webs are passed between two hot metal rolls, one of which has an embossed pattern to impart and achieve the desired degree of point bonding, usually on the order of 10 to 40 percent of the overall surface area being so bonded.

When staple fibers are utilized to form the absorbent nonwoven layer, the fibers may begin in a bundled form as a bale of compressed fibers. In order to decompress the fibers, and render the fibers suitable for integration into a nonwoven fabric, the bale is bulk-fed into a number of fiber openers, such as a garnet, then into a card. The card further frees the fibers by the use of co-rotational and counter-rotational wire combs, then depositing the fibers into a lofty batt. The lofty batt of staple fibers can then optionally be subjected to fiber reorientation, such as by air-randomization and/or cross-lapping, depending upon the ultimate tensile properties of the resulting

nonwoven fabric. The fibrous batt is integrated into a nonwoven fabric by application of suitable bonding means, including, but not limited to, use of adhesive binders, thermobonding by calender or through-air oven, and hydroentanglement.

5           In one embodiment, the absorbent precursor web and the meltblown precursor web are juxtaposed and hydroentangled on a three-dimensional image transfer device. Such three-dimensional image transfer devices are disclosed in U.S. Patent No. 5,098,764, which is hereby incorporated by reference. The two precursor webs may be advanced onto the three-  
10       dimensional image transfer device so that the meltblown precursor web is facing the hydraulic jets of the hydroentanglement process and the absorbent precursor web is in contact with the three-dimensional transfer device. Hydroentangling the precursor webs in this manner allows for the meltblown filaments to become more integrated into the absorbent precursor web.  
15       Further, the meltblown filaments fragment with the force of the water through the meltblown web. The resultant laminate is more drapeable due to the fragmented meltblown filaments.

          In a second embodiment, the absorbent precursor web and the meltblown precursor web are juxtaposed and hydroentangled on a three-  
20       dimensional image transfer device. The two precursor webs may be advanced onto the three-dimensional image transfer device so that the absorbent precursor web is facing the hydraulic jets of the hydroentanglement process and the meltblown web is in contact with the three-dimensional transfer device. Hydroentangling the precursor webs in this manner allows for the  
25       meltblown filaments to remain substantially more intact. The resultant laminate is stiffer due to minimal fragmentation of the meltblown filaments.

          In a third embodiment, the meltblown filaments are extruded and collected directly onto the absorbent precursor web and then subsequently hydroentangled on a three-dimensional image transfer device.

Optionally, the dual performance nonwoven laminate may comprise an additional layer, including, but not limited to a microporous film, a supportive member, such as a spunbond or mesh scrim, or a barrier layer of sorts. Further, the laminate may be comprised of apertures of varying shapes and sizes wherein the apertures extend either partially or entirely through the laminate. Further still, the laminate may optionally be impregnated with a cleaning agent or placed within a tub or other packaging means containing the desired cleaning agent.

The dual performance cleaning laminate embodying the principles of the present invention are suitable as a dry or wet wipe substrate for cleaning both domestic and industrial surfaces, and further for use in skin/facial cleaning. The present nonwoven fabric wipe can be provided in forms that are suitable for use as a dry wipe to absorb liquid, and to provide extra scrubbing effect, as needed.